

NOTES

MORE ON THE TECHNIQUES FOR COLLECTING AQUATIC AND MARSH PLANTS

In 1980 we collected aquatic plants in the vicinity of Vancouver, British Columbia. We were accompanied by Robert R. Haynes and shared with him the joy of collecting aquatics from floristically rich lakes. There were many unforgettable moments. When we read Haynes' recent paper (Haynes, 1984), however, we were surprised to discover the difference between our collecting philosophy and techniques and those he described. We cannot refrain from making a few comments.

1. We do not agree with Haynes' notion, that "if the specimen cannot be determined, it might as well be left in nature." No new taxa would ever be described if one took this notion literally. Although Haynes does not qualify his statement, his instructions are meant "for persons collecting in predominantly tropical areas" (R. R. Haynes, pers. comm.). While we agree that in floristically rich areas it is usually difficult to identify sterile specimens of aquatics, in the temperate zone and floristically poorer areas the situation is simpler. Collectors should not be discouraged, but rather encouraged to collect sterile specimens of those aquatic plants that they cannot find in bloom or fruit.

Many aquatic plants do not flower often. Of the approximately thirty localities of *Megalodonta* (*Bidens*) *beckii* known in British Columbia, there are only two where one finds the species in flower regularly. Although it may be difficult to identify sterile *Megalodonta* using identification keys, someone with an experienced eye can easily make a determination. We have seen only one flowering specimen of *Heteranthera dubia* in British Columbia (where it is known to occur in about fifteen localities) but again, with experience, one can easily identify sterile specimens.

The identification of sterile specimens can be difficult in critical groups, but alternative determination methods can be developed for sterile specimens of aquatics. The anatomical characters of the stem were used to identify broad-leaved species of *Potamogeton* (Ogden, 1943), and minute microscopic characters, such as hairs inside bladders, for identification of *Utricularia* (Komiya, 1972). Different flavonoid patterns of morphologically similar taxa were reported for

Potamogeton (Haynes & Williams, 1975), *Elo-dea* (Mues, 1983), *Isoetes* (Kott & Britton, 1982), etc. We used thin layer chromatography of flavonoids for routine identifications of *Myriophyllum* (Ceska, 1977; Ceska & Ceska, 1986) and *Ceratophyllum* (Ceska & Ceska, 1980).

Since one must use destructive methods for identification, or may send duplicate specimens to specialists for their opinions, it is necessary to collect *more* specimens of sterile aquatic plants than of plants in flower. With more material there is a better chance for identification. Of course, before you collect sterile material you should look around the site carefully for plants having flowers or fruits.

In some cases it is important to keep cultures of living aquatic plants. The formation of floating leaves of *Batrachium* can be induced in culture (Cook, 1966), members of Lemnaceae are relatively easy to keep and study in cultures (cf. Landolt, 1980), and temporary cultures are often required in order to get root tips for chromosome counts. On the one hand, one should be equipped with enough collecting supplies ("ziploc" plastic bags, vials, etc.), on the other, one should not collect more taxa than it is possible to accommodate in the available aquaria or culture flasks.

2. A collecting pole is a must. Ours was constructed from an aluminum pike-pole (also known as a boat-hook) which is generally used for handling logs in water sorting grounds or saw mill ponds. It is about 3 m long and 3 cm in diameter. The iron hook at the end of the pole was replaced by a small three-toothed garden weeding fork. The pole is sturdy, but not heavy. In fact, it is made to float on water when dropped, whereas an ordinary garden rake would sink to the bottom. It fits inside a van or on the roof rack of a station wagon. We use the pole every time we collect aquatic plants, whether we do so from shore or a small inflatable boat. C. D. K. Cook (pers. comm.) uses bunches of welding rods welded together in threes at one end. For collecting Lemnaceae, W. P. Armstrong (pers. comm.) uses an aluminum pole with a coffee can attached to the end.

3. Success in collecting depends on whether it is undertaken from shore or a boat. In listing the

flora of individual water bodies, it is important to know the intensity of collecting activities. For this reason we always note whether or not a boat was used, and all adverse factors (rain, wind) that can lower visibility in water.

4. For pressing, most aquatic plants should be floated. Haynes described the technique in sufficient detail. However, always use a pan (a photographic tray, 14 × 18 inches), and do not use newspaper for floating the plants on. Use acid free paper, either mounting paper or white paper of slightly lower weight. Most of the plants do stick to base paper, which can then be glued easily on a regular mounting paper to make a permanent herbarium specimen. Use only clean water for floating and gently rinse the specimens in another tray or bucket before floating them onto the sheet of paper.

5. Avoid the use of chemicals (alcohol, glycerol, etc.) for the treatment of plants before pressing. Plant pigments, which can provide useful information on specimens, are dissolved in organic solvents and lost (cf. Coradin & Giannasi, 1980). Also, do not use drastic pest control measures, such as dipping the specimen into a mercury-chloride solution, in the herbarium. We found that mercury-chloride treatment destroys flavonoids in dried specimens and makes them useless for chromatographic investigations.

6. Specimens of floating Lemnaceae can be prepared easily using the following technique. Wash the collected mass of plants gently and let them spread on water in a tray or small bowl. Take a sheet of dry writing paper of a suitable size (index card format is the best, two or four sheets fit onto a herbarium sheet) and lay it gently on the surface of the duckweed plants. Peel the sheet from the surface of the water and most of the floating plants (about 70 percent) will stick to the surface of the paper in a single layer. Put the sheet with the plants in between newspaper drying sheets and dry in the normal fashion. One can repeat this peeling of duckweed plants several times with new sheets of paper, but the yield diminishes with every repetition.

Dried specimens of Lemnaceae can easily fall off base paper. In the herbarium they have to be protected in cellophane envelopes or, as W. P. Armstrong (pers. comm.) suggests, in transparent plastic sleeves inserted into manila envelopes mounted on herbarium sheets.

W. P. Armstrong (pers. comm.) also recommends preserving duplicate specimens of *Wolffia* in 70–90 percent ethanol, since the shape and

size of fronds are critical characters. He does not recommend using formalin because the fronds become very fragile.

At this point it may be useful to draw attention to an ingenious technique for photographing Lemnaceae and other small floating plants. Witham (1972) published excellent photographs of these plants by floating them in a tray of milk(!), which provided a neutral white background with no shadows or reflections. For their photographs Armstrong (1984) and Armstrong and Thorne (1984) used a dissecting microscope and substage lighting with a fluorescent illuminator to produce a white background and excellent details of diagnostic characters (W. P. Armstrong, pers. comm.).

Collecting aquatic plants can be a rewarding experience when the resulting specimens are more than a blob of dried plant material on a mounting sheet. The preparation of aquatic plant specimens requires more care than that of dry land plants. This effort is repaid, however, because it facilitates the handling and study of the specimens. Each collector tends to develop his own collecting style and in this process practice is more important than a set of guidelines. We will be grateful, however, if our discussion paper helps anyone interested in aquatic plants to develop good collecting habits.

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